# Initial Observation of High Resolution Velocity Profile and Stratification in the Sunda Strait

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## LONG-TERM GOALS

This pioneering work has main goal of observing and determining the dynamics of controlling circulation in the Sunda Strait – a strategic passage for marine safety and international shipping. (Figure 1).

## OBJECTIVES

The main objectives are to:
(1) measure the magnitude and variability of Sunda Strait flow by deploying Barny Sentinel ADCP to determine the volume transport and its associated heat-freshwater fluxes;
(2) measure vertical stratification of the Sunda Strait and to study its effects due to rough topography/bathymetry, monsoon, and South Java Current.
(3) test the hypothesis whether coastally trapped Kelvin waves could penetrate the Sunda Strait. If it does, how it affects the Strait stratification, mixing, and its interaction with water from the Java Sea.
(4) determine effects of strait dynamics of fish distribution and abundance.

## APPROACH

- ✓ Having international collaborative research among scientists from Lamont Doherty Earth Observatory (LDEO) United States, and Agency for Marine and Fisheries Research (BRKP) Indonesia, and First Institute of Oceanography (FIO), China.
- ✓ Deploy two bottom mount ADCPs in the chocked point of the Sunda Strait
- ✓ Take CTD casts and water samples at various locations within the straits and underway fishfinder as well as ADCP.

## WORK COMPLETED

- Two trawl-resistant bottom mounted (TRBM) moorings (one TRBM belongs to FIO and one TRBM belongs to LDEO) have been deployed in the north end of the Sunda Strait in early November 2008 using R/V Geomarin III.

# Report Documentation Page

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- Twenty four CTD casts were taken during the November 2008 cruise.
- An attempt to recover and redeploy the moorings in August 2009 failed
- In October-November 2009, one mooring (FIO) was successfully recovered using ROV and divers; however, the LDEO mooring was failed to be recovered (Figure 1).
- In January 2010, two replacement moorings (FIO) were successfully deployed in the northern edge of the Sunda Strait. We plan to recover and redeploy them in October/November 2010.

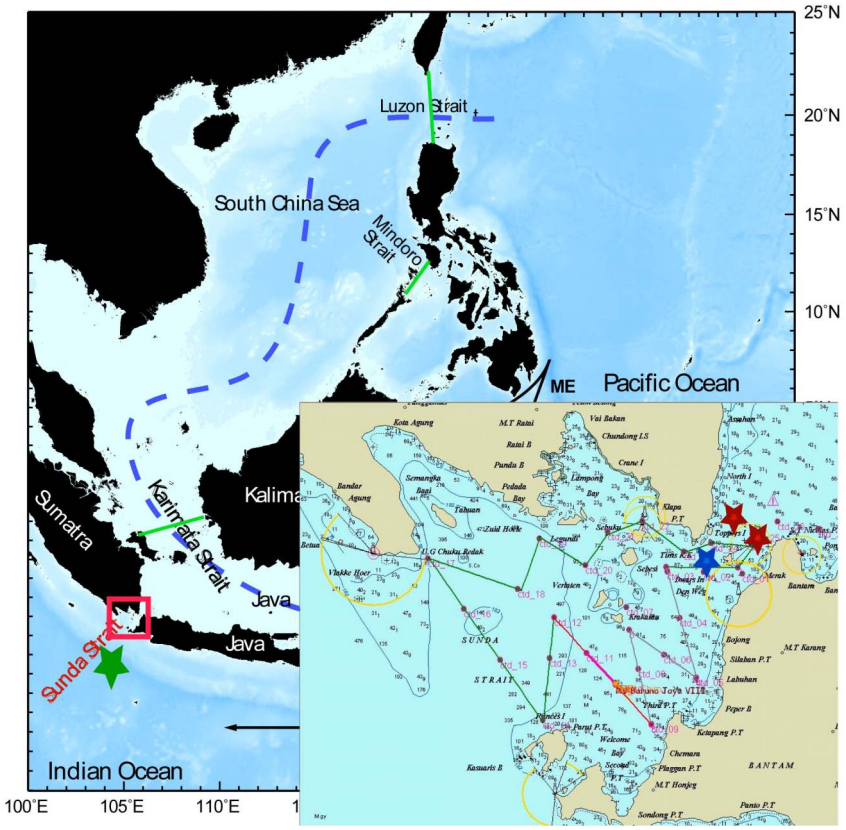


***Figure 1. Indonesian throughflow pathways: Pacific-Makassar Strait-Indian Ocean and Pacific-Luzon Strait-South China Sea-Java Sea. Sunda Strait (red box and inset) connects the Java Sea and the Indian Ocean. Blue star (inset) is unrecovered mooring location in the Sunda Strait. The grid line is the ship track in November 2008 and the red-dots are CTD stations (inset). The green star in the Indian Ocean is the Weidong (FIO-China) upwelling mooring in the Indian Ocean. Replacement moorings were successfully deployed (red-stars) in January 2010.***

## RESULTS

During the first cruise in November 2008, 24 CTD casts have been taken and preliminary results are presented in the Science, Technology and Policy Symposium as part of the World Ocean Conference, in Manado, Indonesia May 11-15, 2009 (Figure 2) and Ocean Obs09 Venice, Italy on 21-25 September 2009 as well as Ocean Science in Portland Oregon, February 2010.

## IMPACT/IMPLICATIONS

Understanding dynamics of Sunda Strait has both scientific and economic benefits i.e. spatial and temporal variability of fish abundances, marine safety and environment and shipping. The Sunda Strait, which connects tropical Indian Ocean and Java Sea (Figure 1), is located between Java and Sumatra centered at 6.0°S and 105.0°E. An active growing volcano "*anak Kratatau*", which is located in the middle of the Strait, adds to the complexity of the rough topography. The Strait provides the first gab of series of Indonesian islands from Sumatra to Timor, where equatorial Kelvin waves from the tropical Indian Ocean propagate eastward along southern coast of this island series and seasonal upwelling along the southern Java-Sumatra (*Arief Murray, 1996; Sprintall et al., 2000; Susanto et al., 2001*). Whether these waves could enter the Sunda Strait is still unknown. Southern Java-Sumatra is also center of interannual variability associated with Indian Ocean Dipole (IOD). Hence, dynamics of Sunda Strait is hypothesized to be affected not only by the complex coastline topography and bathymetry, but also interactions between intraseasonal associated with Madden Julian Oscillation, monsoon, South Java Current, and Indian Ocean Dipole.

## RELATED PROJECT

- ✓ Ongoing project supported by NOAA to measure long-term ITF variability in the Makassar Strait as a continuation of the INSTANT program. Recovery redeployment is planned for May 2011.
- ✓ Ongoing collaborative project (China-Indonesia) to deploy moorings in the Indian Ocean south of the Sunda Strait. Chinese PIs led by Dr. Weidong Yu of the First Institute Oceanography is supported by Chinese NSF and Indonesian PIs led Dr. Budi Sulistyo (BRKP, Indonesia). Both of them have been my long-term collaborators.
- ✓ Ongoing collaborative project (Indonesia-China-USA) on South China Sea – Indonesian Seas Transport/Exchange (SITE) in the Karimata Strait has been funded by NSF starting Spring 2008. One mooring (supported by ONR DURIP N00014-06-1-0738) has been deployed in the Karimata Strait in October/November 2009 and will be recovered after the Sunda cruise in the end of October-November 2010.

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